

What is claimed is:

1. An image processing circuit compressing a dynamic range of an input image, said circuit comprising:

smoothing processing means smoothing a pixel value
5 of the input image while preserving an edge of the input image;

correction coefficient generation means generating a gain correction coefficient according to an output value of said smoothing processing means; and

10 pixel value correction means correcting said pixel value of the input image on a basis of said gain correction coefficient.

2. A method for processing an image to compress a dynamic range of an input image, said method comprising the steps of:

smoothing a pixel value of the input image while preserving an edge of the input image;

generating a gain correction coefficient in
20 accordance with an output value at said smoothing step; and

correcting said pixel value of the input image on a basis of said gain correction coefficient.

25 3. The method according to claim 2, said method further comprising the step of:

correcting a gradation of said pixel value corrected at said step of correcting said pixel value.

30 4. The method according to claim 2, said method further comprising the step of:

emphasizing a variation of said pixel value to be
corrected at said step of correcting said pixel value by
using a subtracted value obtained by subtracting an
output value at said step of smoothing from said pixel
5 value of the input image.

5. The method according to claim 2, said method
further comprising the steps of:

eliminating noises of the input image beforehand;
10 and
enlarging said dynamic range of the input image by
multiplying said pixel value of the input image after
said step of eliminating noise by a uniform gain to
provide said pixel value to said steps of smoothing and
15 correcting said pixel value.

6. The method according to claim 2, wherein said
step of smoothing includes the steps of:

filtering a low frequency component from the input
20 image;
performing a logarithmic transformation of said
pixel value after said step of filtering;
performing nonlinear filtering to suppress a high
frequency component of the image while preserving an edge
25 of the image after said step of logarithmic
transformation; and
performing an inverse logarithmic transformation of
said pixel value after said step of nonlinear filtering.

30 7. The method according to claim 6, wherein,
said step of nonlinear filtering includes the step

of repeating a plurality of filtering wherein

at said plurality of filtering, said pixels value
of the input image is sampled at different pitch from
each other and the high frequency component of the image
5 is suppressed while preserving edges of the image.

8. The method according to claim 6, wherein said
step of nonlinear filtering is performed by sampling
continuous pixels at a prescribed pitch.

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9. The method according to claim 6, wherein said
step of nonlinear filtering includes the steps of:

generating an approximation function approximating
low frequency components of pixel values of pixels within
15 a prescribed extent based on a pixel to be processed;

setting a region corresponding to said low
frequency components on a basis of said approximation
function;

replacing selectively pixel a value, which is
20 judged to be within said region by judging whether said
pixel value is within said region or not concerning
respective pixel values in the prescribed extent based on
said pixel to be processed, with a corresponding pixel
value of said approximation function in accordance with a
25 result of said judging; and

performing weighted addition operation of said
pixel value replaced at said step of replacing.

10. The method according to claim 2, wherein said
30 gain correction coefficient with respect to an output
value at said step of smoothing has a monotonically

decreasing characteristic.

11. The method according to claim 5, wherein said step of eliminating noises includes coring processing.

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12. The method according to claim 5, wherein said step of elimination noises includes processing of a median filter.

10 13. The method according to claim 5, wherein said step of elimination noises comprises the steps of:

replacing selectively a pixel value after judging based on a pixel value of a pixel to be processed concerning pixel values in a prescribed extent based on
15 said pixel to be processed in accordance with said judging; and

performing weighted addition operation of said pixel value replaced at said step of replacing.

20 14. The method according to claim 2, said method further comprising the steps of:

normalizing a color difference signal component of said input image by means of a luminance signal component of said input image beforehand to provide a pixel value
25 based on the luminance signal component to said steps of smoothing and correcting said pixel value; and

correcting a pixel value of said color difference signal after normalizing by means of said pixel value based on said luminance signal component after said pixel
30 value correcting.

15. An apparatus including an image processing circuit for compressing a dynamic range of an input image, said circuit, wherein:

said image processing circuit is the image
5 processing circuit according to claim 1.